

## CLAIMS:

1. A ruggedized analog front-end for interconnecting a network communicative device to a two-conductor based network, comprising:

input and output leads for connection to the network communicative device;

network leads for connection to the two-conductor based network;

a coupling circuit having first, second and third terminal sets, a first coupling channel between the first and second terminal sets, and a second coupling channel between the first and third terminal sets, the first and second coupling channels providing isolation, impedance matching and energy transfer between corresponding ones of the terminal sets;

an amplifier having an input connected to the input leads, and an output connected to the second terminal set of the coupling circuit;

a common mode filter circuit coupled between the first terminal set of the coupling circuit and the network leads;

an attenuator having an input connected to the third terminal set of the coupling circuit, and an output connected to the output leads; and

a power supply circuit for operative power supply of electronic components of the analog front-end.

2. The ruggedized analog front-end according to claim 1, wherein the coupling circuit comprises a transformer having a primary coil and first and second secondary coils, the primary coil being connected to the first terminal set, the first and second secondary coils being connected respectively to the second and third terminal sets, the transformer providing the first and second coupling channels.

3. The ruggedized analog front-end according to claim 1, wherein the first and second coupling channels comprise opto-isolated amplifiers.

4. The ruggedized analog front-end according to claim 1, wherein the amplifier comprises a differential amplifier for amplifying a voltage difference between two input signals received by the input leads.

5. The ruggedized analog front-end according to claim 1, further comprising a protection circuit coupled between the output of the amplifier and the second terminal set of the coupling circuit.

6. The ruggedized analog front-end according to claim 5, wherein the protection circuit comprises a circuit arrangement having diodes and capacitors.

10 7. The ruggedized analog front-end according to claim 1, further comprising a protection circuit coupled between the input of the attenuator and the third terminal set of the coupling circuit.

8. The ruggedized analog front-end according to claim 7, wherein the protection circuit comprises a circuit arrangement having diodes and capacitors.

9. The ruggedized analog front-end according to claim 1, further comprising a band pass filter coupled between the first terminal set of the coupling circuit and the common mode filter circuit.

20 10. The ruggedized analog front-end according to claim 9, wherein:  
the coupling circuit comprises a transformer having a primary coil and first and second secondary coils, the primary coil being connected to the first terminal set, the first and second secondary coils being connected respectively to the second and third terminal sets, the transformer providing the first and second coupling channels; and

the band pass filter and the transformer are combined together into a chip powered by the power supply circuit.

30 11. The ruggedized analog front-end according to claim 1, wherein the common mode filter circuit comprises a low frequency common mode filter connected to a high frequency common mode filter.

12. The ruggedized analog front-end according to claim 1, further comprising a protection circuit coupled between the common mode filter circuit and the network leads.

13. The ruggedized analog front-end according to claim 12, wherein the protection circuit comprises a circuit arrangement having zenner diodes for protection in differential mode of signals sent to and received from the two-conductor based network.

10        14. A network system operable in a harsh environment, comprising:  
a pair of conductors forming at least a part of a two-conductor based network;  
at least one network communicative device; and  
at least one access device interconnectable between the pair of conductors and the at least one network communicative device, the at least one access device having a ruggedized analog front-end as defined in claim 1.

15. The network system according to claim 14, wherein the harsh environment comprises train vehicles.

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16. The network system according to claim 14, wherein the pair of conductors has at least one end provided with a connector for connection with a like pair of conductors of the two-conductor based network.

17. The network system according to claim 14, wherein the at least one network communicative device comprises multiple network communicative devices and the at least one access device comprises multiple access devices each interconnectable between the pair of conductors and a number of the network communicative devices.

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18. The network system according to claim 14, wherein the at least one network communicative device comprises an application unit connectable to the access device, for performing an application.

19. The network system according to claim 18, wherein the network communicative device further comprises a controller for communication of data between the application unit and the two-conductor based network.

20. The network system according to claim 18, wherein the network communicative device further comprises a controller controlling operation of the application unit in response to control signals received on the two-conductor based network.

21. The network system according to claim 18, wherein the at least one access device has a conversion functionality for conversion between communication protocols used by the network communicative device and over the two-conductor based network.

22. The network system according to claim 18, wherein the at least one access device has a switching functionality for communication between the network communicative device and additional network communicative devices connected to the at least one access device.

23. The network system according to claim 14, wherein the at least one network communicative device comprises a HomePNA device.

24. The network system according to claim 14, wherein the at least one network communicative device comprises a power line communication compliant device.